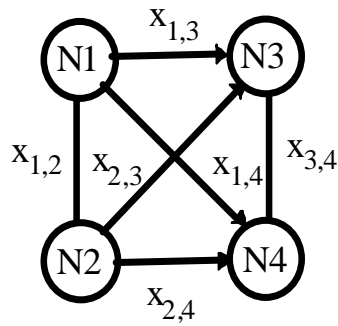


The University of Alabama in Huntsville
Electrical and Computer Engineering
CPE 633 01
Test 2
April 10, 2008

Name: _____

1. (20 points) The four node network shown has six links, out of which four are unidirectional and two are bi-directional. Calculate the path reliability for the pair N2-N4.



2. (20 points) Derive an approximate expression for the reliability of a square (4, 4) interstitial redundancy array with 16 primary nodes and 9 spares. Denote the reliability of a node by R and assume the links are fault-free.

3. (3 points) Most acceptance tests fall into one of these three categories: _____ and _____, and _____.
4. (1 point) A well-known multistage network is the _____.
5. (1 point) Rebooting your PC is an example of _____.
6. (25 points) Consider the issue of version independence with N-version programming. There are 3 versions of the program and three subspaces to consider. The probability of the input being from subspace S1 is 0.2, from subspace S2 0.5 and from subspace S3 0.3. The conditional failure probabilities are as follows:
- | Version | S1 | S2 | S3 |
|---------|-------|-------|-------|
| V1 | 0.010 | 0.009 | 0.005 |
| V2 | 0.020 | 0.004 | 0.010 |
| V3 | 0.015 | 0.016 | 0.014 |

What are the unconditional failure probabilities for the three versions?

If the three versions were stochastically independent, what would the probability of them all failing for the same input be?

What is the actual joint failure probability?

Are the versions positively or negatively correlated?

7. (10 points) Use checksums to detect and correct errors in a scalar by matrix multiplication for the 4 x 4 matrix shown.

$$A = \begin{bmatrix} 1 & 11 & 17 & 6 & 19 \\ 15 & 2 & 12 & 18 & 7 \\ 8 & 16 & 3 & 13 & 20 \\ 10 & 9 & 5 & 4 & 14 \end{bmatrix}$$

Use the corresponding column-weighted matrix AC and assume that during the multiplication of AC by the scalar 4 a single error has occurred resulting in the following output:

$$4 \bullet A = \begin{bmatrix} 4 & 44 & 68 & 24 & 76 \\ 60 & 8 & 48 & 72 & 28 \\ 32 & 64 & 12 & 52 & 80 \\ 39 & 36 & 20 & 26 & 56 \end{bmatrix}$$

8. (20 points) Identify all the consistent recovery lines in the following execution of two concurrent processes.

